CLAIMS

1. A method for recovering substantially all carbon dioxide generated in a combustion process,
characterised in that
the method comprises the following steps:

a) a sweep gas is used to pick up oxygen on the permeate side of a mixed conducting membrane in a first stage which is capable of separating oxygen from a hot air stream fed to the retentate side of the membrane
b) the sweep gas containing oxygen is applied as oxidant in a combuster in the first stage where a carbon containing fuel is combusted
c) hot combustion products of step b) containing CO_2, H_2O and a low concentration of O_2 is used as sweep gas in a membrane in a second stage downstream the combuster in step b)
d) the concentration of oxygen in the sweep gas of step c) is increased in the membrane in the second stage (step c) to a sufficiently high level to be used as oxidant in the combuster in the second stage
e) and the steps c) - d) are repeated in one or more stages.

2. A method for recovering substantially all carbon dioxide generated in a combustion process according to claim 1,
characterised in that
the combuster is a catalytic or non catalytic combuster.

3. A method for recovering substantially all carbon dioxide generated in a combustion process according to claim 1,
characterised in that

the sweep gas used in step a) is hot steam or a mixture of steam and/or recycled exhaust gas from the last combuster in the sequence.

4. A method for recovering substantially all carbon dioxide generated in a combustion process according to claim 1,
characterised in that
the mixed conducting membrane is made from materials with both ionic and electronic conductivity.

5. A method for recovering substantially all carbon dioxide generated in a combustion process according to claim 1,
characterised in that
the air stream is heated by heat exchanging with hot exhaust gas generated in at least one combuster.

6. A method for recovering substantially all carbon dioxide generated in a combustion process according to claim 1,
characterised in that
the air stream, before being heated, is compressed and divided into several streams and each stream is heated in a heat exchanger located between two membrane stages.

7. Use of the method according to claim 1, for generating heat and power.

8. Use of the exhaust gas recovered by the method according to claim 1, for enhanced oil recovery or for injection in a geological formation.

9. Use of the exhaust gas recovered by the method according to claim 1, in a chemical process to make carbon containing products.

10. Use of heated air generated by the method according to claim 1, forgenerating pure oxygen in a mixed conducting membrane.

11. Use of heated air generated by the method according to claim 1, for generating synthesis gas consisting of one or more of the components CO, CO_2, H_2 and N_2 or for generating heat in a mixed conducting membrane reactor where the membrane reactor is capable of reacting a mixture of steam and a carbon containing fuel with oxygen permeated through the said membrane to make synthesis gas and/or heat.